

Three new species of *Lentipes* from Indonesia (Gobiidae)

by

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Abstract. – Three new species of *Lentipes* (*L. argenteus*, *L. ikeae* and *L. mekonggaensis*), freshwater gobies, are described from streams of Sumatra, Java, Bali and Sulawesi (Indonesia). They differ from other species of the genus by a combination of characters including an urogenital papilla lacking lateral lobes and retractable into a sheath-like groove, the number of pectoral fin rays, the number of scales, tricuspid teeth in the upper jaw, and a specific body colour in males.

Résumé. – Trois nouvelles espèces de *Lentipes* d'Indonésie (Gobiidae).

Trois espèces nouvelles de *Lentipes* (*L. argenteus*, *L. ikeae* et *L. mekonggaensis*), gobies d'eau douce, sont décrits de Sumatra, Java, Bali et Sulawesi (Indonésie). Ils diffèrent des autres espèces du genre par plusieurs caractères dont : une papille urogénitale rétractable dans une cavité et sans lobes latéraux, le nombre de rayons aux nageoires pectorales, le nombre d'écailles, le nombre de dents tricuspides à la mâchoire supérieure et une coloration caractéristique des mâles.

Key words

Gobiidae
Lentipes
Sulawesi
Java
Bali
Sumatra
Freshwater
New species

During the past 35 years, many sicydiine gobies have been collected and identified from freshwater streams throughout the tropical Indo-Pacific. Nevertheless, many islands of this region are underprospected (Watson *et al.*, 2007; Keith *et al.*, 2010a,b; Thuesen *et al.*,

2011). Recently, a number of expeditions led by the Indonesian Institute of Sciences (LIPI) in remote areas of Indonesia (i.e. the ICBG project with UC Davis in Mekongga, Sulawesi), and correlated to a collaborative work between the Institute for Research and Development (IRD), the LIPI and the National Museum of Natural History of Paris (MNHN), led to the discovery of further new species.

Compared to other sicydiine genera, *Lentipes* is unique in having tricuspid premaxillary teeth in both males and females, but with generally 0-6 canine teeth at the posterior tip of the premaxilla in males. The ascending process on the premaxilla is narrow at the dorsal tip. The tongue is fused to the floor of the mouth. The pelvic disc is adherent to the belly between all five rays and scales are never present on the nape and the belly in adults (Keith and Lord, 2011a). *Lentipes* also exhibits considerable morphological variation in the shape of the urogenital papilla. A recent study of sicydiine phylogeny based on DNA sequences supports the assembly in the

same clade of the genera *Lentipes*, *Akihito* and *Sicyopus* and their reciprocal monophyly (Taillebois *et al.*, 2014).

Lentipes is currently known by 14 species and is distributed in the Pacific Ocean from Indonesia to Papua New Guinea, and from southern Japan to Hawaii and the Marquesas Islands (Watson *et al.*, 2002; Keith *et al.*, 2006, 2011; Lynch *et al.*, 2013). Among them, five are known from Indonesia (Watson and Kottelat, 1994, 2006; Watson and Allen, 1999; Allen, 2001). The status of *Raogobius andamanicus* Mukerji, 1935, which is considered by some authors as a *Lentipes*, is not clear and is not considered here.

Here, our purpose is to provide a description of three new *Lentipes* known from Sulawesi, Java, Bali and Sumatra (Indonesia).

METHODS

Methods follow Lachner and Karnella (1980) completed by Watson *et al.* (2002) and Keith and Marquet (2005). Measurements were taken with a dial calliper to the nearest tenth of a millimetre. All counts were taken from the right side. The size is given in standard length (SL). Teeth were counted to the right of the premaxillary symphysis. Abbreviations for institutions and collections follow Leviton *et al.*

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(1985). Abbreviations for the cephalic sensory pore system follow Akihito (1986).

Scale and fin ray counts are reported as: A, anal fin elements (including flexible spine and segmented rays); D, dorsal fins (D1, first dorsal fin spines; D2, second dorsal fin elements); P, pectoral fin rays; C, caudal fin rays (only branched rays are reported); LS, scales in lateral series counted from upper pectoral fin base, or anteriormost scale along lateral midline, to central hypural base; PD, predorsal midline scales counted from the scale directly anterior to the first dorsal fin insertion to the anteriormost scale; TRB, transverse series backward, referring to scales counted from the first scale anterior to second dorsal fin origin, in a diagonal manner, posteriorly and ventrally to the anal fin base or ventralmost scale; TRF, transverse series forward, refers to scales counted from the first scale anterior to second dorsal fin origin, in a diagonal manner, anteriorly and ventrally to the centre of abdomen or ventralmost scale; ZZ, zigzag series, referring to scales on the narrowest region of the caudal peduncle counted from the dorsalmost scale to the ventralmost scale in a zigzag (alternating) manner.

***Lentipes mekonggaensis* n. sp. Keith & Hadiaty**
(Figs 1-3, Tabs I-IV)

Comparative material

This new species is compared with *Lentipes* species having no enlarged lobes associated with the urogenital papillae or elongate finger like projections in males, having an urogenital papilla in both sexes that is retractable into a sheath-like groove, and having more than 17 pectoral rays. These species are *Lentipes armatus* Sakai & Nakamura, 1979, *Lentipes venustus* Allen, 2004, and *Lentipes multiradiatus* Allen, 2001.

Lentipes armatus. - 21 specimens from Ishigaki City, Ishigaki Island, Okinawa Prefecture, Ryukyu Islands, Japan. BLIH 1983379, male (34.2 mm SL); Ara River; 10 Jul. 1983. BLIH 1989134, male (39.0 mm SL), BLIH 1989142, female (37.4 mm SL); Ara River; 26 Aug. 1989. BLIH 1989795, 1 male, 1 female (34.0-36.6 mm SL); Ara River; 17 Oct. 1989. BLIH 1991375, female (42.9 mm SL), BLIH 1991686, 2 females (41.4-46.9 mm SL); Ara River; 2 Jul. 1991. NSMT P.29315, paratype, male (34.9 mm SL); Arakawa River; 3 Sep. 1974. URM P3842, 5 males, 5 females (33.1-45.2 mm SL); Miyara River; 29 May 1982. URM P4533, female (41.9 mm SL); Ara River; 4 Sep. 1982. URM P4872, male (37.9 mm SL); Miyara River; 16 Sep. 1982.

Lentipes venustus. - WAM 32372.001 (paratypes) 1 male, 1 female (24.0-28.8 mm SL); Papua New Guinea, Apatubua River, D'Entrecasteaux Islands, Normanby Island Bunama Village, 10°07.067'S-150°09.12'E, 30 Jan. 2003; Allen

& Stevenson. MNHN, uncatalogued, 4 males, 3 females, Papua, crique Bichain 19 Oct. 2010; Keith *et al.* coll.

Lentipes multiradiatus. - WAM 32370.003, 1 male, 3 females (30.0-37.0 mm SL); Papua New Guinea, Awaetowa River, D'Entrecasteaux Islands, Fergusson Island, 09°30.907'S-150°52.04'E, 27 Jan. 2003; Allen & Stevenson. WAM 32374.002, 5 males, 1 female (25.7-37.5 mm SL); Papua New Guinea, Dibuwa River, D'Entrecasteaux Islands, Normanby Island, Yeluyelua Village, 10°02.77'S-151°14.883'E, 30 Jan. 2003; Allen.

Other comparative specimens are those cited in Lynch *et al.* (2013).

Material examined

Eleven specimens from Sulawesi, totalling 5 males, 6 females; size range 29.3-46.3 mm SL [36.6-55.3 mm, total length (TL)], largest male 39.0 mm SL, largest female 46.3 mm SL.

Holotype. - MZB 21473, male (34.4 mm SL), Indonesia, Sulawesi Tenggara province, Kolaka Utara regency, Wawo district, Tinukari village, Sungai Tepasa, (Sungai is a river in Bahasa Indonesia), 03°38'32.6"S-121°05'47.3"E; 30 Jun. 2011, Hadiaty, Wowor & Sopian coll.

Paratypes. - MZB 21474, 2 males (29.3-30.9 mm SL) and 3 females (43.4-46.3 mm SL), same data as holotype. MNHN 2013-0653, 2 males (29.3-32.0 mm SL), same data as holotype. MNHN 2013-0652, 3 females (37.6-39.0 mm SL), same data as holotype.

Diagnosis

The new species has 19-20 pectoral rays, a second dorsal and anal fins I10, and 28-33 lateral scales. The urogeni-

Table I. - Number of pectoral rays for *Lentipes* species.

	15	16	17	18	19	20
<i>L. adelphizonus</i>		1	1	1		
<i>L. argenteus</i>		2	8	1		
<i>L. armatus</i>			1	12	8	
<i>L. caroline</i>		21				
<i>L. concolor</i>	1	21	27	7		
<i>L. crittersius</i>					1	
<i>L. dimetrodon</i>	5	1				
<i>L. ikeae</i>		4	7			
<i>L. kaeae</i>			24	4		
<i>L. mekonggaensis</i>					5	6
<i>L. mindanaoensis</i>		1				
<i>L. multiradiatus</i>			3	20	13	2
<i>L. rubrofasciatus</i>	2	5	1			
<i>L. solomonensis</i>		6	4			
<i>L. venustus</i>			3	5	1	
<i>L. watsoni</i>		3	7			
<i>L. whittenorum</i>			3	5	2	

tal papilla is retractable into a sheath-like groove and is without lobes or other expanded tissue. The male is characterised by few tricuspid teeth in the upper jaw (10-16), ctenoid scales on anterior body region strongly ossified, the base of the first dorsal fin not reaching the base of the second dorsal fin origin, and a specific body colour, with a bright red head, a red band on caudal peduncle and orange dorsal fins.

Description

The number of pectoral rays in *Lentipes* species are given in table I, the number of upper jaw teeth in table II, meristic counts in table III, and morphometrics expressed to the nearest whole percent of standard length in table IV. Below, the holotype counts are given first, followed in brackets if different, by paratype counts.

First dorsal fin (D1) with six flexible spines, second dorsal fin (D2) with one flexible spine and ten segmented rays (D VI-I,10). Anal fin with one flexible spine and ten segmented rays (A I,10) and directly opposite to second dorsal fin. Base of first dorsal fin not reaching base of second dorsal fin origin in both sexes; the distance between D1 and D2 is about half the eye diameter in male; spines not filamentous in both sexes. Pelvic fins constitute a strong adhesive disc adherent to abdomen between all five rays. Pectoral fin with 19-20 rays, ventralmost 1st or 2nd rays simple; posterior margin slightly rounded. Caudal fin (C) with 13 branched rays.

Lateral scales (LS) 32(28-33). No difference in scale number and arrangement between sexes. They are lightly embedded and mainly cycloid in females. Generally limited to caudal peduncle, few may extend anteriorly along midline between second dorsal and anal fins; some ctenoid scales are on the anteriormost part of the flanks. Males have mainly ctenoid scales, strongly developed with prominent spines on anterior body region, and few cycloid scales on caudal peduncle. Scales in transverse backwards (TRB) series 11(11-13) and in transverse forward series (TRF) 10(7-12). Zigzag scales (ZZ) 12(9-12). Head, breast, nape and belly without scales. Upper jaw teeth distinctly tricuspid anteriorly, males 10(10-16), females (24-32). Pre-maxilla in males with 3(2-6) recurved canines posterior to tricuspid teeth; females without teeth posterior to tricuspid teeth. Teeth in lower jaw recurved and canine in males 3(3-5); no teeth in females. Cephalic sensory pore system A, B, C, D, F, H, K, L, N and O; pore H & K sometimes fused. Pore D singular with all others paired (Fig. 2); oculoscapular canal divided into anterior and posterior canal between pores H and K. Some cutaneous sensory papillae present on head.

Table II. - Number of upper jaw teeth in studied species of *Lentipes*.

	Tricuspid teeth																																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	
<i>L. mekonggaensis</i> males										2	-	-	1	-	1	1																			
<i>L. mekonggaensis</i> females																		2	-	2	3	1	1		2	-	1	1	-	1	1				
<i>L. armatus</i> males																																			
<i>L. armatus</i> females																																			
<i>L. multiradiatus</i> males								2	2	1	-	-	-	-	-	1																			
<i>L. multiradiatus</i> female																																			
<i>L. venustus</i> males	1	-	-	1	-	1	-	-	1	-	-	-	-	1													2	-				1	1	-	1
<i>L. venustus</i> females																									1	2	1								
	Conical teeth																																		
	0	1	2	3	4	5	6	7	8	9																									
<i>L. mekonggaensis</i> males																																			
<i>L. mekonggaensis</i> females	6		1	1	2	-	1																												
<i>L. armatus</i> males																																			
<i>L. armatus</i> females	11			1	4	2	2	1																											
<i>L. multiradiatus</i> males																																			
<i>L. multiradiatus</i> female	5																																		
<i>L. venustus</i> males																																			
<i>L. venustus</i> females	3	1																																	

Table III. - Meristic counts in studied species of *Lentipes*.

	Lateral scales																				
	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
<i>L. mekonggaensis</i>											2	–	2	1	4	2					
<i>L. armatus</i>									2	2	4	2	5	3	1	1	1				
<i>L. multiradiatus</i>																1	–	1	1	1	2
<i>L. venustus</i>	1	–	–	–	1	–	1	–	2	1	–	–	–	1	–	1					
	Zigzag scales						Scales in transverse backwards														
	8	9	10	11	12	13	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
<i>L. mekonggaensis</i>		3	5	2	1											4	5	2			
<i>L. armatus</i>		5	9	4	2	1										2	2	5	7	4	1
<i>L. multiradiatus</i>		2	4	3	2												3	4	–	2	
<i>L. venustus</i>	1	4	3	1			2	–	–	–	1	2	–	1	2						
	Scales in transverse forwards																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16				
<i>L. mekonggaensis</i>								1	2	1	3	2	1								
<i>L. multiradiatus</i>								1	2	2	5										
<i>L. venustus</i>	2	–	2	2	–	–	2	1													

Table IV. - Morphometrics in studied species of *Lentipes* expressed to the nearest whole percent of standard length.

	Predorsal length																												
	32	33	34	35	36	37	38	39	40	41	42	43	44	45															
<i>L. mekonggaensis</i>			1	1	1	2	3	1	–	2																			
<i>L. armatus</i>	1	–	–	–	–	2	3	7	6	2																			
<i>L. multiradiatus</i>				1	–	2	1	–	2	2	–	–	2	1															
<i>L. venustus</i>				2	1	–	2	1	1	1	–	–	1																
	Preanal length										Head length									Jaw length									
	56	57	58	59	60	61	62	63	64	65	21	22	23	24	25	26	27	28	29	9	10	11	12	13	14	15			
<i>L. mekonggaensis</i> males						3	1	1							2	1	1	–	1					3	2				
<i>L. mekonggaensis</i> females						2	–	3	1		1	–	2	–	2	1					1	3	1						
<i>L. armatus</i> males		1	–	4	3	1	2							3	6	1							9	1					
<i>L. armatus</i> females				1	–	4	2	3	1			8	3							3	7	1							
<i>L. multiradiatus</i> males	1	1	1	–	–	–	1	–	1	1			1	–	1	2	2						2	–	1	3			
<i>L. multiradiatus</i> female	1	–	–	–	–	1	1	1	1					1	3	1						1	3	1					
<i>L. venustus</i> males		1	1	2	–	1								1	1	1	2						2	2	1				
<i>L. venustus</i> females		1	1	–	1	1						3	1										2	1	1				
	Caudal peduncle length										Caudal peduncle depth																		
	12	13	14	15	16	17	18	19	20	8	9	10	11	12															
<i>L. mekonggaensis</i> males			1	1	1	2					1	1	3																
<i>L. mekonggaensis</i> fem.	2	1	1	1							2	4																	
<i>L. armatus</i> males								6	4		1	3	6																
<i>L. armatus</i> females						1	3	6	1		3	6	1																
<i>L. multiradiatus</i> males			1	1	3	1						3	3	1															
<i>L. multiradiatus</i> female			2	3						1	2	1	1																
<i>L. venustus</i> males		1	2	2								1	2	2															
<i>L. venustus</i> females		2	2								1	1	2																

Table IV. Continued.

	Body depth in males at second dorsal origin							
	11	12	13	14	15	16	17	18
<i>L. mekonggaensis</i>				2	3			
<i>L. armatus</i>	1	–	1	1	1	2	2	2
<i>L. multiradiatus</i>	2	–	1	3				
<i>L. venustus</i>			1	1	2	–	1	

	Second dorsal fin length																Anal fin length											
	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	23	24	25	26	27	28	29	30	31	32	33		
<i>L. mekonggaensis</i> males			1	–	1	–	1	–	1	1							1	1	–	1	1	1	–	1	1			
<i>L. mekonggaensis</i> females			5	1													1	1	–	1	1	2						
<i>L. armatus</i> males				1	1	2	3	1	2											1	2	3	3	–	1			
<i>L. armatus</i> females	1	4	4	2													1	–	5	3	2							
<i>L. multiradiatus</i> males			1	–	1	1	–	–	2										1	–	3	–	–	1	1			
<i>L. multiradiatus</i> female					1	1	–	–	3										1	1	1	–	1	–	1			
<i>L. venustus</i> males				1	1	–	–	–	1	–	–	1	–	1					2	1	–	–	–	–	1	1		
<i>L. venustus</i> females			2	1	–	1														1	–	2						

	Caudal fin length									
	18	19	20	21	22	23	24	25	26	
<i>L. mekonggaensis</i> males						1	2	–	2	
<i>L. mekonggaensis</i> females		2	2	–	1	–	1			
<i>L. armatus</i> males	1	–	–	1	3	5				
<i>L. armatus</i> females			1	6	3	1				
<i>L. multiradiatus</i> males				2	–	2	1	1		
<i>L. multiradiatus</i> female		1	1	1	–	–	1	1		
<i>L. venustus</i> males		1	–	–	–	1	1	–	2	
<i>L. venustus</i> females	1	–	–	2	1					

Sexual dimorphism well developed. Ctenoid scales on anterior body region strongly ossified in males, each with 3-5 prominent spines; scales on posterior part of body with fewer, but larger ctenii than those of females. Urogenital papilla in males slender and pointed distally without associated lobes or expanded tissue (Fig. 3A), urogenital papilla retractable into a sheath-like groove; female urogenital papilla rectangular in appearance (Fig. 3B) and also retractable into a sheath-like groove. Jaw length, head length and caudal peduncle length greater in males. Dorsal, caudal and anal fins longer in males.

Colour in preservation

Male. - Background of body greyish. Background of head greyish to blackish. Snout dusky. Head ventrally greyish. Lateral midline without a well-marked black subcutaneous band. All scales on flanks and caudal peduncle with black margins. Nape greyish. Caudal fin rays greyish. Dorsal and anal fins blackish, with a lighter margin. Pelvic disc without pigment. Pectoral rays greyish. Pectoral fin base greyish.

Female. - Mostly white. Head and body greyish to whitish. More or less lateral midline with a black subcutaneous band terminating as a brownish spot at caudal fin base.

Above midline some dusky bars and bands may be present and dorsally few dusky square shaped saddles may be present. Blackish spot medially at base of caudal fin; may be absent in some specimens. Dorsal rays and spines whitish, membrane and rays distally without pigment. Caudal fin rays whitish, membrane and distal margin without pigment. Anal fin without pigmentation at base of rays and spine. Pelvic disc not pigmented. Pectoral rays and membrane greyish. Pectoral base whitish.

Colour in life (Fig. 1)

Male. - Background of body greyish. Background of head and snout reddish. Dorsal margin of head greyish, upper lip red. Head ventrally whitish. Lateral midline without a well-marked black subcutaneous band. All ctenoid scales on flanks and caudal peduncle with black margins.

Bright orange dorsal fins, with a blue-edged black spot in middle of membrane between first two dorsal rays of the second dorsal fin. Caudal and pectoral fins translucent. Anal fin bluish to green in the anterior part and red in the posterior part.

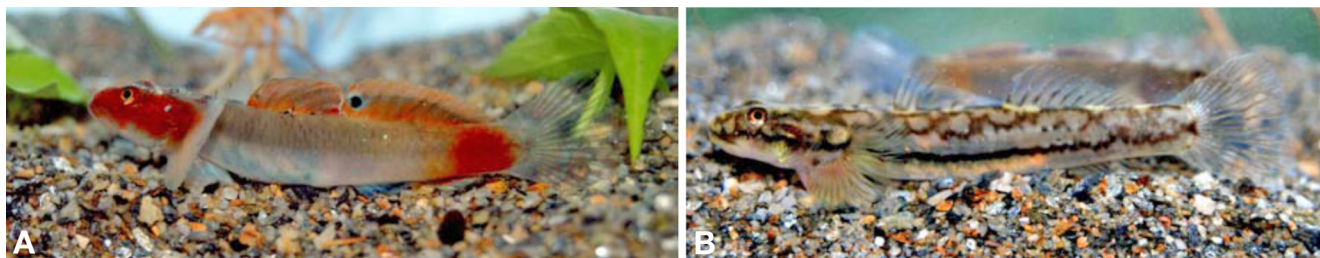


Figure 1. - *Lentipes mekonggaensis*. **A**: Male; **B**: Female. (Pictures by R. Hadiaty).

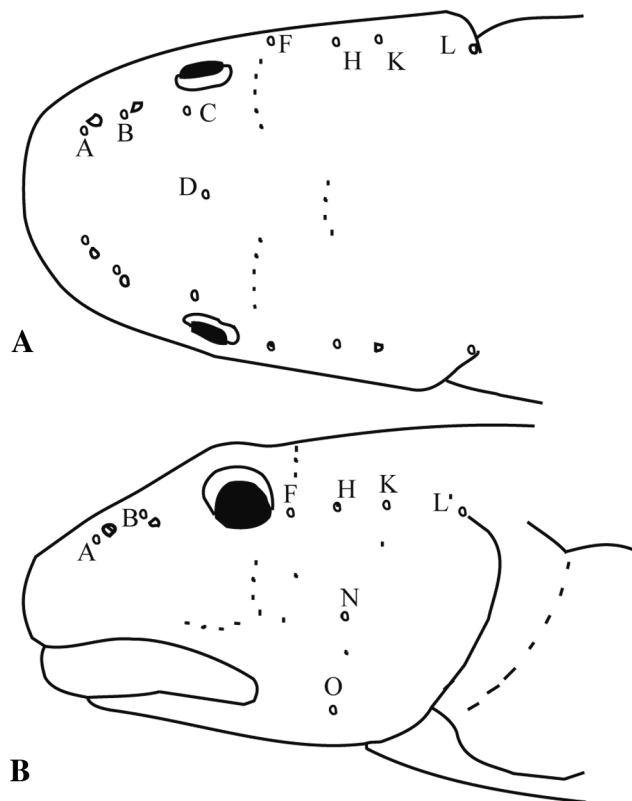


Figure 2. - Diagrammatic illustration of head in *Lentipes mekonggaensis* (male) showing head pores and sensory papillae. **A**: Dorsal view; **B**: Lateral view.

Female. - Colour less variable in females. Greyish to brownish with dusky markings appearing similar to that in preservation.

Distribution

Currently known only from river Tepasa, Indonesia, Sulawesi Tenggara province.

Ecology

Lentipes mekonggaensis was collected in a swift, clear high gradient stream with a rocky and boulder-strewn bottom at the edge of oil palm plantation (388 m above sea level). It

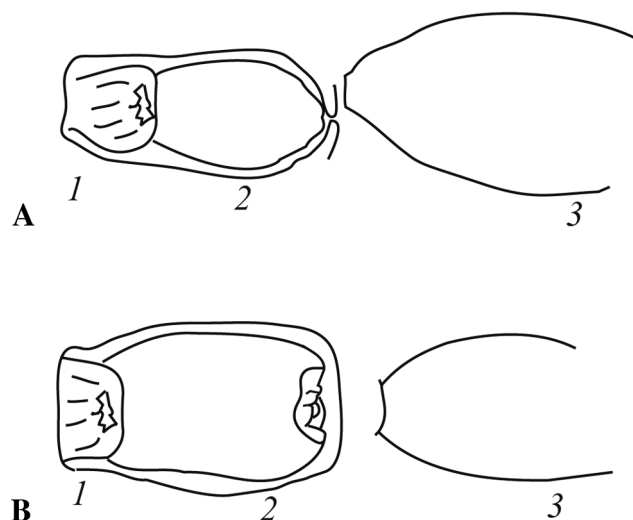


Figure 3.- Diagrammatic illustration of urogenital papilla in *Lentipes mekonggaensis*. **A**: Male; **B**: Female. 1: anus; 2: urogenital papilla; 3: anal fin.

is presumed to be amphidromous as the other members of the subfamily (Keith, 2003; McDowall, 2007).

Comparison

Lentipes mekonggaensis differs from *L. kaeae*, *L. rubrofasciatus*, *L. solomonensis* and *L. whittenorum* in not having enlarged lobes associated with the urogenital papilla in males. It differs from *L. adelphizonus* in not having elongate finger like projections anterior to the urogenital papillae in males. From *L. dimetrodon* it differs in having 19-20 pectoral fin rays vs. 15-16, from *L. argenteus* (this paper) and *L. ikeae* (this paper) in having 19-20 pectoral fin rays vs. 16-17.

Lentipes mekonggaensis differs from *L. armatus*, *L. venustus* and *L. multiradiatus* in having, in male, the base of the first dorsal fin not reaching the base of the second dorsal fin origin vs. reaching the base of the second dorsal fin origin, and distinctive bright red colours on body. Furthermore, it differs also from *L. armatus* in having fewer tricuspid teeth in the upper jaw in males (10-16 vs. 18-27); from *L. venustus* and *L. armatus* in having longer preanal length (61-63 vs. 57-61/57-62% SL) and jaw length in males (14-15

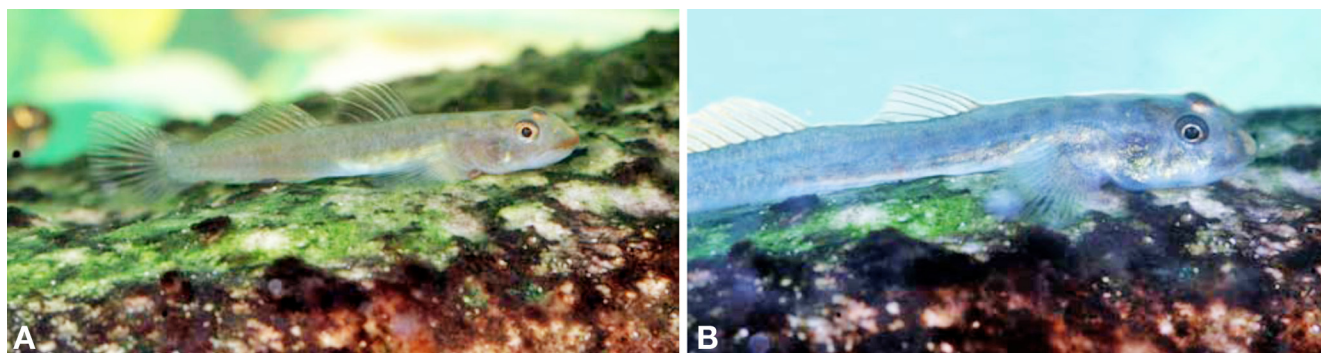


Figure 4. - *Lentipes argenteus*. A: Male; B: Female. (Pictures by P. Keith)

vs. 12-14/13-14% SL). Finally, it differs from *L. multiradiatus* in having fewer scales in lateral series (28-33 vs. 33-42), and a smaller second dorsal fin length in females (28-29 vs. 30-34).

Etymology

The name of the species is derived from the name of Mekongga mountain (Sulawesi), where the specimens were caught.

Lentipes argenteus, n. sp. Keith, Hadiaty & Lord (Figs 4-6, Tabs V-VII)

Comparative material

The new species is compared with *Lentipes* species having no enlarged lobes associated with the urogenital papillae or elongate finger like projections in males, having an urogenital papilla in both sexes that is retractable into a sheath-like groove, and having 15-17 pectoral rays. These species are *Lentipes dimetrodon* Watson & Allen, 1999, *Lentipes watsoni* Allen, 1997 and *Lentipes ikeae* n. sp., this paper.

Lentipes dimetrodon. - MZB 8001 (holotype), male (21.6 mm SL); Indonesia, Papua, Omamerwai Creek, 9 Aug. 1995; G.R. Allen. MZB 8002 (paratype), male (19 mm SL), same data as holotype. WAM P.31059-003 (paratypes), 2 males (21.0-23.3 mm SL) and 1 male, 1 female (19.0-23.5 mm) same data as holotype.

NB: WAM P.31059-003 is the correct catalog number of WAM paratypes of *L. dimetrodon* and not WAM P.31059-

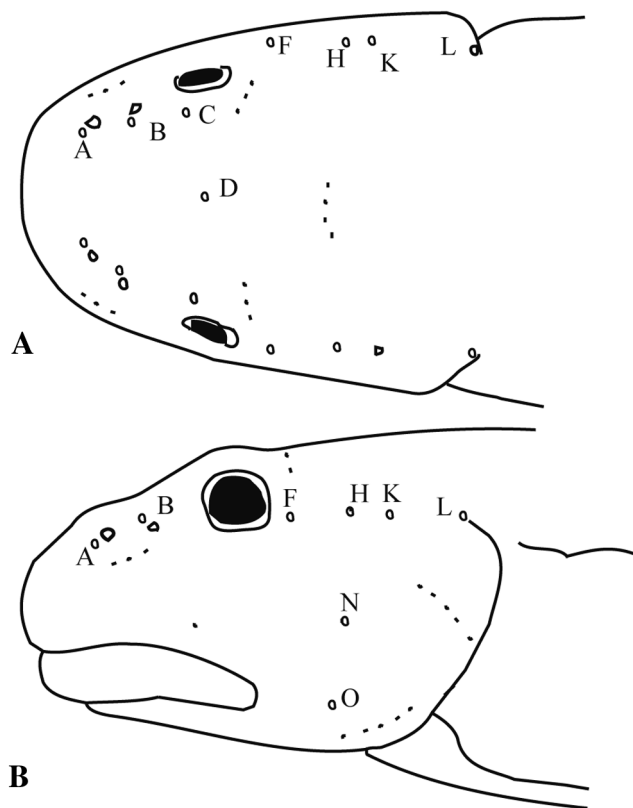


Figure 5. - Diagrammatic illustration of head in *Lentipes argenteus* (male) showing head pores and sensory papillae. A: Dorsal view; B: Lateral view.

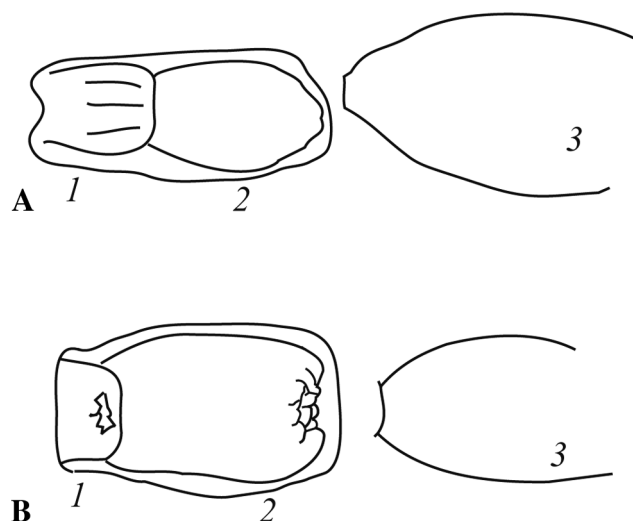


Figure 6. - Diagrammatic illustration of urogenital papilla in *Lentipes argenteus*. A: Male; B: Female. 1: anus; 2: urogenital papilla; 3: anal fin.

Table V. - Number of upper jaw teeth in studied species of *Lentipes*.

	Tricuspid teeth																			
	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
<i>L. ikeae</i> males	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
<i>L. ikeae</i> females																				
<i>L. argenteus</i> males																				
<i>L. argenteus</i> females																				
<i>L. dimetrodon</i> males																				
<i>L. dimetrodon</i> female																				
<i>L. watsoni</i> males																				
<i>L. watsoni</i> females																				

	Conical teeth						
	0	1	2	3	4	5	6
<i>L. ikeae</i> males			1	2	2	1	
<i>L. ikeae</i> females	5						
<i>L. argenteus</i> males			7	1	1	1	
<i>L. argenteus</i> females	3						
<i>L. dimetrodon</i> males		1	2	1	1		
<i>L. dimetrodon</i> female	1						
<i>L. watsoni</i> males				1	1	1	1
<i>L. watsoni</i> females	3						

Table VI. - Meristic counts in studied species of *Lentipes*.

	Lateral scales																																				
	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	
<i>L. ikeae</i>											1	—	—	—	1	2	3	1	1	—	1																
<i>L. argenteus</i>																																					
<i>L. dimetrodon</i>	1	1	1	—	1	—	1																														
<i>L. watsoni</i>																																					

	Zigzag scales					Scales in transverse backwards										Scales in transverse forwards																				
	7	8	9	10	11	3	4	5	6	7	8	9	10	11	12	13	14	0	1	2	3	4	5	6	7	8	9	10	11							
<i>L. ikeae</i>																		1	—	1	3	4	1	—	1											
<i>L. argenteus</i>	4	4	2	1		1	3	2	2	1	2							2	—	3	1	3	1	—	1											
<i>L. dimetrodon</i>	1	3	1	1			1	1									1	—	—	—	—	1														
<i>L. watsoni</i>	2	2	2										2	—	1												1	—	2							

002 as cited by mistake in the original description [S. Morrison (WAM), pers. com.].

Lentipes watsoni. - WAM P.31221-001 (holotype), male, 47.4 mm SL, Papua New Guinea: Gulf Province, Sapoi River; 12-19 Nov. 1996; G.R. Allen. WAM P.31221-002 (paratypes), 3 males, 3 females (44.7-64.4 mm SL), same data as holotype.

Lentipes ikeae n. sp. this paper.

Material examined

Eleven specimens from Sumatra, totalling 8 males, 3 females; size range 26-38 mm SL [33-46 mm, total length (TL)], largest male 34 mm SL, largest female 38 mm SL.

Holotype. - MZB 21475, male (29.7 mm SL), Clearwater Hillstreams in Padang, West Sumatra, Jun. 2013, M. Negrini don.

Paratypes. - MZB 21476, 2 males (25.8-27.8 mm SL) and 1 female (38.4 mm SL), same data as holotype. MNHN 2013-0651, 5 males (26.7-34.0 mm SL) and 2 females (33.6-37.8 mm SL), same data as holotype.

Diagnosis

The new species has 16-17 pectoral rays, 4-8 scales in transverse backwards series, 35-49 lateral scales and a first dorsal fin with 5-6 flexible spines. The urogenital papilla is retractable into a sheath-like groove and is without lobes or other expanded tissue. The female is characterised by 30-34 tricuspid teeth in the upper jaw. The male has a specific body

Table VII. - Morphometrics in studied species of *Lentipes* expressed to the nearest whole percent of standard length.

	Predorsal length													
	30	31	32	33	34	35	36	37	38	39	40	41	42	
<i>L. ikeae</i>						2	1	1	4	1	—	1	1	
<i>L. argenteus</i>	1	1	2	2	2	—	1	2						
<i>L. dimetrodon</i>						1	—	4	1					
<i>L. watsoni</i>						1	4	—	—	—		1		

	Preanal length														Head length						Jaw length							
	50	51	52	53	54	55	56	57	58	59	60	61	62	20	21	22	23	24	25	26	8	9	10	11	12	13	14	15
<i>L. ikeae</i> males						1	—	2	—	2						2	—	3	1					4	2			
<i>L. ikeae</i> females								1	—	—	3	1		1	1	2	1						2	2	1			
<i>L. argenteus</i> males	1	1	1	—	1	2	2									2	2	1	3				1	5	2			
<i>L. argenteus</i> females		1	—	—	—	1	1								3						2		1					
<i>L. dimetrodon</i> males				1	—	—	—	—	—	3	1							2	2	1			1	2	2			
<i>L. dimetrodon</i> female										1							1			1								
<i>L. watsoni</i> males									1	—	1	—	1						1	2							2	1
<i>L. watsoni</i> females													3				2	1					1	2				

	Caudal peduncle length											Caudal peduncle depth				
	13	14	15	16	17	18	19	20	21	22	7	8	9	10	11	12
<i>L. ikeae</i> males	2	1	2	—	1									2	3	1
<i>L. ikeae</i> females			1	2	1	1								3	1	1
<i>L. argenteus</i> males					1	3	2	1	1		1	2	5			
<i>L. argenteus</i> females				1	2						3					
<i>L. dimetrodon</i> males						1	2	1	1					1	2	2
<i>L. dimetrodon</i> female						1								1		
<i>L. watsoni</i> males					1	1	1							1	1	
<i>L. watsoni</i> females								2	—	1			1			

	Body depth in males at second dorsal origin							
	10	11	12	13	14	15	16	17
<i>L. ikeae</i>				2	3	1		
<i>L. argenteus</i>	2	3	3					
<i>L. dimetrodon</i>				1	2	2		
<i>L. watsoni</i>					3			

Table VII. Continued.

	Second dorsal fin length																		
	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		
<i>L. ikeae</i> males						2	1	1	1	–	1								
<i>L. ikeae</i> females	1	2	1	1															
<i>L. argenteus</i> males					1	1	2	1	–	1	2								
<i>L. argenteus</i> females	1	–	1	–	–	1													
<i>L. dimetrodon</i> males											1	–	1	–	1	–	2		
<i>L. dimetrodon</i> female			1																
<i>L. watsoni</i> males					1	2													
<i>L. watsoni</i> females	1	1	1																
	Anal fin length																		
	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	18	19
<i>L. ikeae</i> males					1	–	1	1	3										
<i>L. ikeae</i> females		1	2	1	1													1	–
<i>L. argenteus</i> males							2	1	2	1	–	1	1						
<i>L. argenteus</i> females						2	1												
<i>L. dimetrodon</i> males												1	1	1	1	–	1		
<i>L. dimetrodon</i> female					1														
<i>L. watsoni</i> males			1	1	1														
<i>L. watsoni</i> females	1	2																1	1
	Caudal fin length																		
	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
<i>L. ikeae</i> males																			
<i>L. ikeae</i> females																			
<i>L. argenteus</i> males																			
<i>L. argenteus</i> females																			
<i>L. dimetrodon</i> males																			
<i>L. dimetrodon</i> female																			
<i>L. watsoni</i> males																			
<i>L. watsoni</i> females																			

colour, generally entirely greyish to silver with a slightly reddish upper lip.

Description

The number of pectoral rays in *Lentipes* species are given in table I, the number of upper jaw teeth in table V, meristic counts in table VI, and morphometrics expressed to the nearest whole percent of standard length in table VII. Below, the holotype counts are given first, followed in brackets if different, by paratype counts.

First dorsal fin (D1) with 5-6 flexible spines, second dorsal fin (D2) with one flexible spine and 9-10 segmented rays (D1 V-VI; D2 I,9-10). Anal fin with one flexible spine and 9-10 segmented rays (A I,9-10) and directly opposite to second dorsal fin. Base of first dorsal fin not reaching base of second dorsal fin origin in both sexes; the distance between D1 & D2 is about half (or more) the eye diameter in male. Spines of D1 not filamentous in both sexes; 4th and 5th longer. Pelvic fins constitute a strong adhesive disc adherent to abdomen between all five rays. Pectoral fin with 16-17 rays, ventralmost 1st or 2nd rays simple; posterior margin slightly straight. Caudal fin (C) with 13 branched rays.

Lateral scales (LS) 36(35-49). They are lightly embedded and mainly cycloid in female. Generally not limited to caudal peduncle, many extend anteriorly along midline between second dorsal and anal fins; some ctenoid scales are on the anteriormost part of the flanks. Males have mainly ctenoid scales, developed with prominent spines on anterior body region, and few cycloid scales on caudal peduncle. Scales in trans-

verse backwards (TRB) series 6(4-8) and in transverse forward series (TRF) 3(1-8). Zigzag scales (ZZ) 11(8-11). Head, breast, nape and belly without scales. Upper jaw teeth distinctly tricuspid anteriorly, males 17(17-22), females 30-34. Premaxilla in males with 2(2-5) recurved canines posterior to tricuspid teeth; females without teeth posterior to tricuspid teeth. Teeth in lower jaw recurved and canine in males 5(2-6), no teeth in females. Cephalic sensory pore system A, B, C, D, F, H, K, L, N and O. One male with M, N and O; pore D missing in one male, but when present singular with all others paired (Fig. 5); oculoscapular canal divided into anterior and posterior canal between pores H and K. Some cutaneous sensory papillae present on head and body.

Sexual dimorphism well developed. Ctenoid scales on anterior body region ossified in males, each with generally three prominent spines; scales on posterior part of body with fewer, but larger ctenii than those of females. Urogenital papilla in males slender and pointed distally without associated lobes or expanded tissue (Fig. 6A), urogenital papilla retractable into a sheath-like groove; female urogenital papilla rectangular in appearance (Fig. 6B) and also retractable into a sheath-like groove. Second dorsal, anal and caudal fin lengths, jaw length and caudal peduncle depth greater in males.

Colour in preservation

Male. - Background of body greyish. Background of head greyish. Head ventrally greyish. Lateral midline with a marked black subcutaneous band. All scales on flanks and

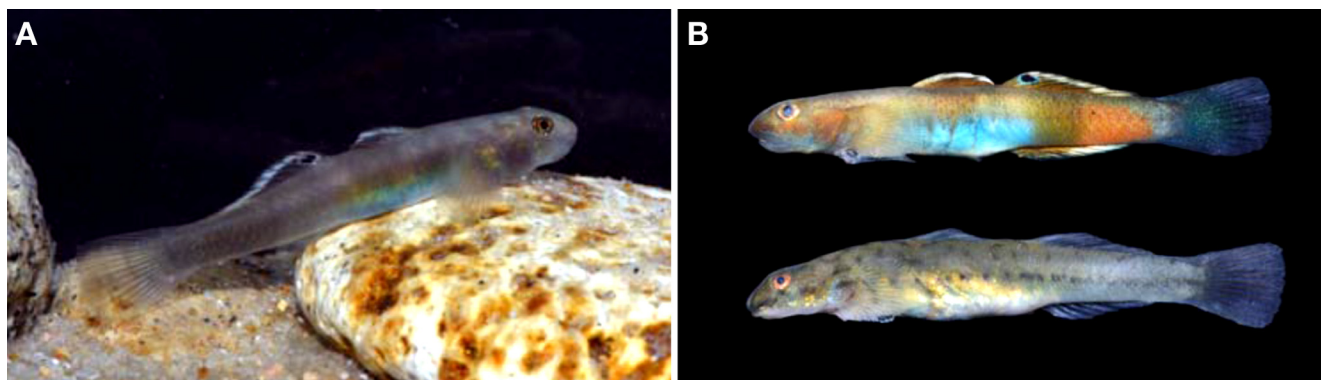


Figure 7. - *Lentipes ikeae*. A: Male (picture by F. Busson); B: Above, male, Paratype MZB 21387 (picture by N. Hubert; BIF 1730); Below, female (picture by N. Hubert; BIF 1747).

caudal peduncle with black margins. Top of head blackish. Nape greyish. Caudal peduncle pinkish to reddish. Caudal fin rays greyish. Dorsal and anal fins blackish. Pelvic disk without pigment. Pectoral rays greyish. Pectoral fin base greyish.

Female. - Mostly greyish. Head and body greyish to whitish. More or less lateral midline with a black subcutaneous band. Caudal fin rays greyish. Dorsal rays and spines whitish, membrane and rays distally without pigment. Caudal fin rays whitish, membrane and distal margin without pigment. Anal fin without pigmentation at base of rays and spine. Pelvic disc not pigmented. Pectoral rays and membrane greyish. Pectoral base greyish.

Colour in life (Fig. 4)

Male. - Background of body greyish to silver. Background of head greyish to silver. Dorsal margin of head greyish to silver, upper lip slightly reddish. Head ventrally greyish to silver; opercula and pectoral fin base pinkish. Lateral midline greyish to silver. All ctenoid scales on flanks and caudal peduncle with black margins. Belly white to silver. Caudal peduncle greyish or slightly reddish. Dorsal fins greyish, with tiny black spots on the membrane. Sometimes a slightly black and blue spot on the anterior part of the second dorsal fin. Caudal and pectoral fins translucent. Anal fin greyish.

Female. - Greyish to silver with markings appearing similar to that in preservation.

Distribution

Currently known from Padang, West Sumatra Province (Indonesia).

Ecology

Lentipes argenteus was collected in a swift, clear high gradient stream with a rocky and boulder-strewn bottom. It is presumed to be amphidromous as the other members of the subfamily (Keith and Lord, 2011b).

Comparison

Lentipes argenteus differs from *L. kaeae*, *L. rubrofasciatus*, *L. solomonensis* and *L. whittenorum* in not having enlarged lobes associated with the urogenital papilla in males. It differs from *L. adelphizonus* in not having elongate finger like projections anterior to the urogenital papillae in males. It differs from *L. armatus*, *L. venustus*, *L. multiradiatus* in having 16-17 pectoral fin rays vs. 17-20 and a second dorsal fin mainly I,9 vs. I,10.

Lentipes argenteus differs from *L. dimetrodon* in having more scales in lateral series (36-49 vs. 14-20), a shorter anal fin length (28-35 vs. 34-39% SL), generally the 4th and the 5th spines of D2 longer vs. the 5th and 6th spines of D2 longer, and the coloration in males. Furthermore, it differs from *L. watsoni* in having fewer teeth in upper jaw in females (30-34 vs. more than 39), fewer scales in transverse backwards (TRB) series (4-8 vs. 11-13), in transverse forward series (TRF) (1-8 vs. 8-10), and live coloration in males. It differs from *L. ikeae* n. sp. (this paper) in having more scales in lateral series (35-49 vs. 23-35), a greater distance between the bases of D1 and D2 in males [about half (or more) the eye diameter vs. nearly touching]; a lower peduncle depth in both males and females (7-9 vs. 10-12 / 7 vs. 9-11% SL, respectively), a smaller predorsal length (30-37 vs. 35-42), a longer caudal peduncle length in males (17-21 vs. 13-17), and the coloration in males.

Etymology

The new species is named *argenteus* with reference to the distinctive colour pattern of males.

Lentipes ikeae, n. sp. Keith, Hubert, Busson & Hadiaty
(Figs 7-9, Tabs V-VII)

Comparative material

The new species is compared with *Lentipes* species having no enlarged lobes associated with the urogenital papillae

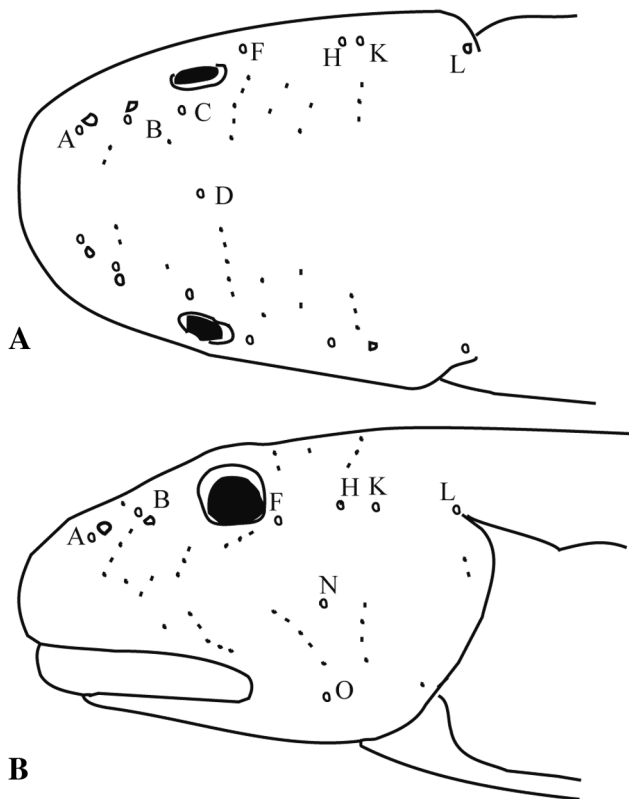


Figure 8. - Diagrammatic illustration of head in *Lentipes ikeae* (male) showing head pores and sensory papillae. **A**: Dorsal view; **B**: Lateral view.

or elongate finger like projections in males, having a urogenital papilla in both sexes that is retractable into a sheath-like groove, and having 15-17 pectoral rays. These species are *Lentipes dimetrodon*, *Lentipes watsoni*, and *L. argenteus* n. sp. in this paper.

Material examined

Eleven specimens from Java, totalling 6 males, 5 females; size range 29.7-38.0 mm SL [34.5-44.8 mm, total length (TL)], largest male 32.5 mm SL, largest female 38.0 mm SL.

Holotype. - MZB 21477, male (32.4 mm SL), Cisolok, Kab Sukabumi, Java, 13 Dec. 2013, Hubert *et al.* coll; BIF 1792.

Paratypes. - MZB 21387, 2 males (29.7-32.5 mm SL), Cisukawayana, Kab Sukabumi, Java, 12 Dec. 2013, Hubert *et al.* coll; BIF 1730, 1732. MZB 21388, 3 females (36.9-37.6 mm SL), same data as holotype; BIF 1796, 1801, 1802. MNHN 2013-073, 2 males (31.3-32.5 mm SL), Cisukawayana, Kab Sukabumi, Java, 12 Dec. 2013; Hubert *et al.* coll; BIF 1731, 1733. MNHN 2013-650, 1 male and 2 females (32.0-37.8 mm SL), same data as holotype; BIF 1793, 1794, 1795.

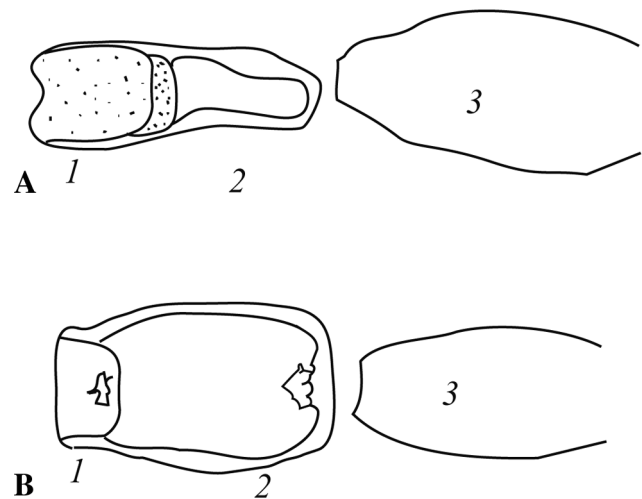


Figure 9. - Diagrammatic illustration of urogenital papilla in *Lentipes ikeae*. **A**: Male; **B**: Female. 1: anus; 2: urogenital papilla; 3: anal fin.

Diagnosis

The new species has 16-17 pectoral rays, a second dorsal and anal fins with I,9, and 23-35 lateral scales. The urogenital papilla is retractable into a sheath-like groove and is without lobes or other expanded tissue. The base of the first dorsal fin is not reaching (or slightly reaching) the base of the second dorsal fin origin in both sexes. The male has a specific body colour, with a blue belly, a second dorsal fin with one or two black spots, and a more or less visible bright red band on caudal peduncle.

Description

The number of pectoral rays in *Lentipes* species are given in table I, the number of upper jaw teeth in table V, meristic counts in table VI, and morphometrics expressed to the nearest whole percent of standard length in table VII. Below, the holotype counts are given first, followed in brackets if different, by paratype counts.

First dorsal fin (D1) with 6 flexible spines, second dorsal fin (D2) with one flexible spine and 9 segmented rays (D VI-I,9). Anal fin with one flexible spine and 9 segmented rays (A I,9) and directly opposite to second dorsal fin. Base of first dorsal fin not reaching (or slightly reaching) base of second dorsal fin origin in both sexes; spines not filamentous in both sexes. 5th ray of first dorsal fin the longest in males. Pelvic fins constitute a strong adhesive disc adherent to abdomen between all five rays. Pectoral fin with 16-17 rays, ventralmost 1st or 2nd rays simple; posterior margin slightly straight. Caudal fin (C) with 13 branched rays.

Lateral scales (LS) 30(23-35). They are lightly embedded and mainly cycloid in female. Generally not limited to caudal peduncle, many extend anteriorly along midline between

second dorsal and anal fins; some ctenoid scales are on the anteriormost part of the flanks. Males have some ctenoid scales, not strongly developed, along midline and beyond the base of pectoral fins. Cycloid scales on caudal peduncle. Scales in transverse backwards (TRB) series 4 (4-8) and in transverse forward series (TRF) 2 (0-7). Zigzag scales (ZZ) 9 (8-10). Head, breast, nape and belly without scales. Upper jaw teeth distinctly tricuspid anteriorly, males 13 (11-22), females (27-35). Premaxilla in males with 3 (3-6) recurved canines posterior to tricuspid teeth; females without teeth posterior to tricuspid teeth. Teeth in lower jaw recurved and canine in males 2 (2-5), no teeth in females. Cephalic sensory pore system A, B, C, D, F, H, K, L, N and O; pore D singular with all others paired (Fig. 8); oculoscapular canal divided into anterior and posterior canal between pores H and K. Sensory papillae well developed on head and body.

Sexual dimorphism well developed. Second dorsal and anal fin lengths, jaw length, predorsal length, head length and caudal peduncle depth greater in males. Urogenital papilla in males slender and pointed distally without associated lobes or expanded tissue (Fig. 9A), urogenital papilla retractable into a sheath-like groove; female urogenital papilla rectangular in appearance (Fig. 9B) and also retractable into a sheath-like groove.

Colour in preservation

Male. - Background of body greyish. Background of head greyish to whitish. Head ventrally greyish, isthmus whitish. Flanks greyish on anterior and middle part; caudal peduncle pinkish. Top of head greyish. Nape greyish. Caudal fin rays greyish to blackish. Dorsal and anal fins blackish. Pelvic disk without pigment. Pectoral rays greyish. Pectoral fin base greyish.

Female. - Mostly greyish. Head and body greyish to whitish. Belly greyish. More or less lateral midline with a black subcutaneous band. Caudal fin rays greyish. Dorsal rays and spines blackish, membrane and rays distally with pigment. Caudal fin rays whitish. Anal fin without pigmentation at base of rays and spine. Pelvic disc not pigmented. Pectoral rays and membrane greyish. Pectoral base greyish.

Colour in life (Fig. 7)

Male. - Background of body greyish. Background of head and snout greyish. Dorsal and ventral margin of head greyish; opercula dark greyish. Lateral midline greyish. Dorsal fins black with a white margin. Belly bright blue. A yellow to green patch at pectoral base. The second black dorsal fin with one or two black spots rounded with a white margin. A more or less visible vertical bright red band on caudal peduncle. Caudal and pectoral fins translucent. Anal fin greyish.

Female. - Greyish with markings appearing similar to that in preservation.

Distribution

Currently known from Java and Bali (Indonesia).

Ecology

Lentipes ikeae was collected in small and rapid mountain stream with a rocky bottom and boulder-strewn at an altitude ranging between 310 and 488 above sea level. It is presumed to be amphidromous as the other members of the subfamily (Keith and Lord, 2011b).

Comparison

Lentipes ikeae differs from *L. kaaea*, *L. rubrofasciatus*, *L. solomonensis* and *L. whittenorum* in not having enlarged lobes associated with the urogenital papilla in males. It differs from *L. adelphizonus* in not having elongate finger like projections anterior to the urogenital papillae in males. It differs from *L. armatus*, *L. venustus*, *L. multiradiatus* in having 16-17 pectoral fin rays vs. 17-20 and a second dorsal fin I,9 vs. I,10.

Lentipes ikeae differs from *L. dimetrodon* in having more scales in lateral series (23-35 vs. 14-20), generally the 4th and 5th spines of D2 longer vs. the 5th and 6th spines of D2 longer, and the coloration in males. Furthermore, it differs from *L. watsoni* in having D2 I9 and A I9 vs. D2 I10 and A I10, fewer teeth in upper jaw in females (27-35 vs. more than 39), fewer scales in lateral scales (23-35 vs. 35-39), in transverse backwards (TRB) series (4-8 vs. 11-13) and in transverse forward series (TRF) (0-7 vs. 8-10). It differs from *L. argenteus* n. sp. (this paper) in having fewer scales in lateral series (23-35 vs. 35-49), a smaller distance between the bases of D1 and D2 in males [nearly touching vs. about half (or more) the eye diameter]; a greater peduncle depth in both males and females (10-12 vs. 7-9/ 9-11 vs. 7% SL, respectively), a smaller caudal peduncle length in males (13-17 vs. 17-21), and the coloration in male.

Etymology

The new species is named for Miss Ike Rachmatika, the late staff of Ichthyology lab in MZB, to honour her work and passion for the freshwater fish of Indonesia.

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